IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Newton *et al.*

Examiner: Lund, Jeffrie Robert

Serial No.: 10/065,879

Group Art Unit: 1763

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Docket No.: **BUR9-2001-0144-US1**

Title: **NON-PLASMA REACTION APPARATUS AND METHOD**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL APPEAL BRIEF OF APPELLANTS

This Supplemental Appeal Brief, pursuant to the Notification of Non-Compliant Appeal Brief dated November 1, 2006 and pursuant to the Office Action mailed April 5, 2005, is an appeal from the rejection of the Examiner dated April 13, 2004. The present Supplemental Appeal Brief addresses the rejections of claims in the Office Action mailed April 5, 2005

REAL PARTY IN INTEREST

International Business Machines Corporation is the real party in interest.

RELATED APPEALS AND INTERFERENCES

None.

STATUS OF CLAIMS

Claims 2 and 18 have been canceled. Claims 13-16 have been withdrawn. Claims 1, 3-12, 17, 19 and 20 have been rejected. This Brief is in support of an appeal from the rejection of

claims 1, 3-12, 17, 19 and 20.

STATUS OF AMENDMENTS

There are no After-Final Amendments which have not been entered. The Examiner withdrew the finality of the office action of April 13, 2004 because Claims 3 and 19 had not been rejected and the Examiner noticed that claims under appeal were not identical to the claims of record as a result of an After Final amendment that was filed on May 19, 2004 that was entered and contained amendments to intended by the Applicants. Therefore the finality of the office action of April 13 was withdrawn.

SUMMARY OF CLAIMED SUBJECT MATTER

A. CLAIM 1 - INDEPENDENT

The present invention provides an apparatus (10) comprising a chamber adapted for holding a workpiece having a surface layer adapted for being etched (see FIGS. 1-2, specification, page 6, lines 1-2 and 27-28). The apparatus comprises a distribution plate (40) including a first plurality of channels (3) for providing a first fluid to flow into the chamber at an angle θ_1 with respect to an exposed surface (43) of the distribution plate (40) (see FIG. 5; specification, page 14, lines 2-12) and a second plurality of channels (5) for providing a second fluid to flow into the chamber at an angle θ_2 with respect to the exposed surface (43) of the distribution plate (40) (see FIG. 6B; specification, page 14, lines 13-24). The first plurality of channels (3) and the second plurality of channels (5) are arranged in rings (44, 46, 48, 41) around

a common point (49) of the distribution plate (40) (see FIG. 2; specification, page 7, lines 9-15). Each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees (see specification, page 14, lines 7-8 and 18-19).

B. CLAIM 17 - INDEPENDENT

The present invention provides a distribution plate (40) comprising a first plurality of channels (3) for providing a first fluid to flow into a chamber at an angle θ_1 with respect to an exposed surface of the distribution plate (40) (see FIG. 5; specification, page 14, lines 2-12) and a second plurality of channels (5) for providing a second fluid to flow into the chamber at an angle θ_2 with respect to the exposed surface of the distribution plate (40) (see FIG. 6B; specification, page 14, lines 13-24). The first plurality of channels (3) and the second plurality of channels (5) are arranged in rings (44, 46, 48, 41) around a common point (49) of the distribution plate (40) (see FIG. 2; specification, page 7, lines 9-15). Each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees (see specification, page 14, lines 7-8 and 18-19).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1, 3, 5-7, 9-12, 17, and 19-20 stand rejected as allegedly unpatentable under 35 U.S.C. 103(a) over Mitani *et al. et al.* ("JP '780") in view of Deacon *et al.*, US Patent 5,792,269 ("U.S. '269").

2. Claim 4 stands rejected as allegedly unpatentable under 35 U.S.C. 103(a) over Mitani *et al.* ("JP '780") and Deacon *et al.*, US Patent 5,792,269 ("U.S. '269") as applied to Claims 1, 3, 5-7,

9-12, 17, and 19-20 above, and further in view of Plavidal *et al.*, US Patent 5,718,795 ("U.S. '795").

3. Claim 8 stands rejected as allegedly unpatentable under 35 U.S.C. 103(a) over Mitani *et al.* ("JP '780") and Deacon *et al.*, US Patent 5,792,269 ("U.S. '269") as applied to Claims 1, 3, 5-7, 9-12, 17, and 19-20 above, and further in view of Hasegawa *et al.*, US Patent 5,837,093 ("U.S. '093").

ARGUMENT

GROUND OF REJECTION 1

Claims 1, 3, 5-7, 9-12, 17, and 19-20 stand rejected as allegedly unpatentable under 35 U.S.C. 103(a) over Mitani *et al. et al.* ("JP '780") in view of Deacon *et al.*, US Patent 5,792,269 ("U.S. '269").

The Examiner rejected Claims 1, 3, 5-7, 9-12, 17, and 20 under 35 U.S.C. 103(a) as allegedly being unpatentable over Mitani *et al.* ("JP '780") and Deacon *et al.*, US Patent 5,792,269 ("U.S. '269").

Appellants respectfully contend that claims 1 and 17 are not unpatentable under 35 U.S.C. 103(a) over Mitani in view of Deacon, because Mitani in view of Deacon does not teach or suggest the feature: "wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees".

The Examiner admits that Mitani teaches $\theta_1 = \theta_2 = 90$ degrees. The Examiner argues: "Deacon et al teaches channels 41 that are angled at 72 degrees, and includes an annular ring (baffle plate) constricting the exhaust gases between the ring's edge and the wall of the chamber... The motivation for angling the channels of Mitani et al is to improve step coverage as taught by Deacon et al."

In response, Appellants assert that the Examiner's argument as to why it is allegedly obvious to modify Mitani by the teaching of Deacon (i.e., to improve step coverage) is not persuasive.

A first reason why it is not obvious to modify Mitani by the alleged teaching of Deacon relates to the fact that Mitani and Deacon employ their respective apparatus to solve different surface covering problems, so that the benefit allegedly obtained by Deacon does not apply to Mitani.

Deacon's apparatus is configured with of a distribution plate having angled channels to solve the problem of using gas species to cover the sidewalls of metal lines in a parallel array of metal lines having a high aspect ratio (i.e., ratio of metal height to spacing between metal lines), and a distribution plate having angled channels is used because the gas species do not effectively penetrate the spaces between the metal lines when the aspect ratio is large (see Deacon, col. 2, lines 19-39). If high aspect ratio does not exist, Deacon's angled channels are not applicable, since Deacon discloses that gases flowing at 90 degrees with respect to the gas distribution faceplate 30 (see FIG. 2 in Deacon) will provide uniform coverage over the entire surface of a wafer (see Deacon, col. 1, lines 26041; col. 2, lines 10-18).

In contrast, Mitani's apparatus uses a distribution plate having 90-degree channels to provide uniform in-plane coverage of a surface by chemical vapor deposition (CVD) (see Mitani, page 1, lines 3-5). Mitani's apparatus provides exceptional in-plane coverage of a uniform film thickness to within ±3% (see Mitani, page 6, lines 4-7). Therefore, since Mitani's apparatus is directed to in-plane (i.e., planar) coverage wherein there is no high aspect ratio issue, and since Deacon achieves a good film in-plane uniformity within a wide range of pressures (i.e., to within ±3% of film uniformity), there is not no benefit of using a distribution plate having angled channels in Mitani's apparatus whose specific objective is to obtain uniform in-plane coverage.

Therefore, it is not obvious to modify Mitani to use a distribution plate having angled channels.

A second reason why it is not obvious to modify Mitani by the alleged teaching of Deacon is that modifying Mitani to angled channels in Mitani's gas distribution faceplate may diminish the excellent in-plane coverage that Mitani achieves (i.e., "a good film in-plane uniformity within a wide range of pressures" - see Mitani, page 1, lines 3-5) to within ±3% of film uniformity (see Mitani, page 6, lines 4-7) with the use of 90-degree channels.

Mitani's apparatus works as described in Matani, page 3, bottom line - page 4, line 17: "[S]aid CVD device [is] characterized as having a gas feeding nozzle part that faces a susceptor inside a reaction tube, and by the fact that said nozzles are distributed in a concentric state, and the gas feeding amount and conductance can be controlled for each one of several nozzle groups that are distributed in the radial direction... The distribution of gas partial pressure on a susceptor that is placed perpendicular to the flow of gas in a cylindrical reaction tube is a concentric distribution. Thus, by using a CVD device that uses gas nozzles that are distributed concentrically with regard to the susceptor, and by adjusting the gas flow amount and conductance with regard to multiple concentric nozzle groups is able to correct and equalize the distribution of the aforesaid gas partial pressure, it is possible to equalize the gas pressure on the multiple sample face in a wide range of gas pressures and a wide range of temperature regions. As a result, the in-plane distribution of the CVD film thickness is improved."

Thus, the use of a distribution plate having 90-degree channels achieves Mitani's objective of obtaining uniform in-plane film coverage on planar surfaces, by controlling the gas

feeding amount and conductance individually for nozzle group of the groups distributed concentrically in the radial direction. If instead the angled channels were to replace the 90-degree channels in Mitani's gas distribution faceplate 30 (see FIG. 2 in Deacon), it may be more difficult to control the gas feeding amount and conductance individually to achieve uniform in-plane film coverage, because for each concentric ring of nozzles, the use of 90-degree channels results in simple geometric relationships between the spatial locations on the ring and the positions on the surface being covered by gas flow from the ring. In contrast, a distribution plate having angled channels would make the geometric relationships more complex, which may make it more difficult to achieve uniform in-plane film coverage.

Appellants note that Deacon explains that the use of a distribution plate having 90-degree channels provide uniform coverage for planar surfaces (see Deacon, col. 1, lines 26041; col. 2, lines 10-18), and Deacon does not consider the issue of how a distribution plate having angled channels would impact coverage for planar surfaces. In fact, the Examiner has not cited any prior art that has analyzed the issue of how a distribution plate having angle channels impacts coverage for planar surfaces.

In summary, whereas Mitani teaches that the use of a distribution plate having 90-degree channels achieves Mitani's objective of obtaining uniform in-plane film coverage on planar surfaces to within ±3% as indicated *supra*, there is no teaching in the prior art that the use of a distribution plate having angled channels would improve in-plane film coverage on planar surfaces. Moreover, there is no teaching in the prior art that the use of a distribution plate having angled channels is not less effective for in-plane film coverage on planar surfaces as compared with the use of a distribution plate having 90-degree channels.

Therefore, it is not obvious to modify Mitani to use a distribution plate having angled channels.

In "Response to Argument", the Examiner argues that "it is generally known that the gas distribution plate is dependent on each method performed in a deposition or etching apparatus, and the gas distribution plate must be optimized for each method".

In response, Appellants note that the use of a distribution plate having angled channels is optimized (as compared with 90-degree channels) in the deposition apparatus of Deacon for a method of covering sidewalls of metal lines having a high aspect ratio. In addition, Appellants note that the use of a distribution plate having 90-degree channels is very effective in the deposition apparatus of Mitani for a method of covering a planar surface. Moreover, the effect of a distribution plate having angled channels (as compared with 90-degree channels) for planar coverage using the apparatus of Mitani is unknown. Therefore, it is not obvious to modify Mitani to use a distribution plate having angled channels.

In "Response to Argument", the Examiner also argues that "each deposition or etching apparatus can be used for many different processes".

In response, Appellants maintain that Deacon's deposition apparatus, which uses a distribution plate having angled channels, can be used effectively for the process of covering sidewalls of metal lines having a high aspect ratio. However, the Examiner has not supplied any evidence to demonstrate that Deacon's deposition apparatus, which uses a distribution plate having angled channels, can be used more effectively for the process of covering a planar surface

than Mitani's deposition apparatus which uses a distribution plate having 90-degree channels. Therefore, it is not obvious to modify Mitani to use a distribution plate having angled channels.

Based on the preceding arguments, Appellants respectfully contend that claims 1 and 17 are not unpatentable under 35 U.S.C. 103(a) over Mitani in view of Deacon, and that claims 1 and 17 are in condition for allowance. Since claims 3, 5-7, and 9-12 depend from claim 1, Appellants maintain that claims 3, 5-7, and 9-12 are likewise in condition for allowance. Since claims 19-20 depend from claim 17, Appellants maintain that claims 19-20 are likewise in condition for allowance.

In addition with respect to claim 5, Appellants respectfully contend that Mitani in view of Deacon does not disclose the feature: "wherein the rings of the first and second types are concentric rings, wherein each ring has a diameter from about 1.75 inches to about 7.04 inches".

The Examiner alleges that Mitani discloses the preceding feature of claim 5, but does not provide a citation to Mitani to support the allegation.

In response, Appellants assert that, although Mitani teaches concentric rings in the distribution plate, Mitani does not disclose that each ring the rings of first and second types have a diameter from about 1.75 inches to about 7.04 inches.

Therefore, the Examiner has not established a *prima facie* case of obviousness in relation to claim 5.

In addition with respect to claim 6, Appellants respectfully contend that Mitani in view of Deacon does not disclose the feature: "wherein paths of the fluids through the distribution plate further comprises grooves and wherein a volume of the grooves is greater than a volume of the channels".

The Examiner alleges that Mitani discloses that the grooves have a greater volume than the channels, but does not provide a citation to Mitani to support the allegation..

In response, Appellants assert that Mitani does not disclose that the grooves have a greater volume than the channels.

Therefore, the Examiner has not established a *prima facie* case of obviousness in relation to claim 6.

In addition with respect to claim 9, Appellants respectfully contend that Mitani in view of Deacon does not disclose the feature: "wherein the chamber further comprises a lower annular ring that includes a plurality of holes extending over an exhaust port".

The Examiner admits that Mitani does not disclose the preceding feature of claim 9, but does not provide a prior art citation that allegedly discloses the preceding feature of claim 9. Therefore, the Examiner has not established a *prima facie* case of obviousness in relation to claim 9.

The Examiner alleges the following motivation for modifying Mitani to incorporate the preceding feature of claim 9: "The motivation for adding the annular ring is to improve the uniformity of the exhaust gas flow by providing a restricted area that equalizes the suction applied by the vacuum pump to the chamber".

In response, Appellants assert that the Examiner has not established that the prior art teaches or suggests the preceding alleged motivation. Established case law requires that the prior art must contain some suggestion or incentive that would have motivated a person of ordinary skill in the art to modify a reference or to combine references. See Karsten Mfg. Corp. V. Cleveland Gulf Co., 242 F.3d 1376, 58 U.S.P.Q.2d 1286, 1293 (Fed. Cir. 2001 ("In holding an invention obvious in view of a combination of references, there must be some suggestion, motivation, or teaching **in the prior art** that would have led a person of ordinary skill in the art to select the references and combine them in a way that would produce the claimed invention"). See also In re Gordon, 733 F.2d 900, 902, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984 ("The mere fact that the prior art could be so modified would not have made the motivation obvious **unless the prior art suggested the desirability of the modification**.").

Therefore, the Examiner has not established a *prima facie* case of obviousness in relation to claim 9.

In addition with respect to claim 10, Appellants respectfully contend that Mitani in view of Deacon does not disclose the feature: "wherein the opening between the upper annular ring and either the workpiece or the chamber wall is at least 3/8 inch".

The Examiner admits that Mitani does not disclose the preceding feature of claim 10, but does not provide a prior art citation that allegedly discloses the preceding feature of claim 10.

Therefore, the Examiner has not established a *prima facie* case of obviousness in relation to claim 10.

The Examiner alleges the following motivation for modifying Mitani to incorporate the preceding feature of claim 9: "The motivation for making the constriction at least 3/8 of an inch is to optimize size of the constriction".

In response, Appellants cite *In re Antonie*, 559 F.2d 618, 619, 195 U.S.P.Q. 6, 8 (C.C.P.A. 1977) which held that varying a variable to optimize a result is obvious only if the prior art has disclosed that the variable is a result effective variable for optimizing the result. In application to claim 10, the Examiner has not provided any evidence from the prior art demonstrating that the opening between the upper annular ring and either the workpiece or the chamber wall is a result effective variable for optimizing the result.

Therefore, the Examiner has not established a *prima facie* case of obviousness in relation to claim 10.

In addition with respect to claim 11, Appellants respectfully contend that Mitani in view of Deacon does not disclose the feature: "wherein the distribution plate is located from about 1/8 inch to about 3 ½ inches from a surface of the workpiece".

The Examiner has not addressed the preceding feature of claim 11.

Therefore, the Examiner has not established a *prima facie* case of obviousness in relation to claim 11.

In addition with respect to claim 12, Appellants respectfully contend that Mitani in view of Deacon does not disclose the feature: "the first fluid comprises ammonia gas and the second fluid comprises hydrogen fluoride gas, the first fluid and the second fluid are adapted to react

inside the chamber to form a self-limiting etchable layer on a portion of the adapted surface layer of the workpiece".

The Examiner admits that Mitani does not disclose the preceding feature of claim 12, but does not provide a prior art citation that allegedly discloses the preceding feature of claim 12. Therefore, the Examiner has not established a *prima facie* case of obviousness in relation to claim 12.

The Examiner alleges the following motivation for modifying Mitani to incorporate the preceding feature of claim 9: "The motivation for supplying a specific gas to each channel is to deposit a specific layer".

In response, Appellants note the Examiner's alleged motivation is misdirected, because the Examiner has not supplied motivation for using specifically ammonia gas and hydrogen fluoride gas as the first fluid and second fluid, respectively.

In addition, the Examiner has not established that the prior art teaches or suggests the preceding alleged motivation. Established case law requires that the prior art must contain some suggestion or incentive that would have motivated a person of ordinary skill in the art to modify a reference or to combine references. See Karsten Mfg. Corp. V. Cleveland Gulf Co., 242 F.3d 1376, 58 U.S.P.Q.2d 1286, 1293 (Fed. Cir. 2001 ("In holding an invention obvious in view of a combination of references, there must be some suggestion, motivation, or teaching **in the prior art** that would have led a person of ordinary skill in the art to select the references and combine them in a way that would produce the claimed invention"). See also In re Gordon, 733 F.2d 900, 902, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984 ("The mere fact that the prior art could be so

modified would not have made the motivation obvious **unless the prior art suggested the desirability of the modification**.").

Therefore, the Examiner has not established a *prima facie* case of obviousness in relation to claim 12.

In addition with respect to claim 20, Appellants respectfully contend that Mitani in view of Deacon does not disclose the feature: "wherein the first fluid is provided to the first plurality of channels and the second fluid is provided to the second plurality of channels without premixing of the first and second fluids".

The Examiner has not addressed the preceding feature of claim 20.

Therefore, the Examiner has not established a *prima facie* case of obviousness in relation to claim 20.

In addition with respect to claims 3 and 19, Appellants respectfully contend that Mitani in view of Deacon does not disclose the feature:

> "wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees **with respect to** the XY plane and wherein each angle θ_1 is offset **from the XY plane** at an offset angle α_1 and β_1 **with respect to** the XY plane, and wherein each angle θ_2 is offset **from the XY plane** at an offset angle α_2 and β_2 **with respect to** the XY plane, and wherein α_1, β_1, α_2, and β_2 are selected from the group consisting of from about 0 to -45 and from about 0 to +45 degrees **with respect to** the XY plane"(emphasis added).

Appellants submit that claims 3 and 19 require that each angle θ_1 and θ_2 be offset **from the XY plane** by offset angles α_1 and β_1 (for θ_1) and α_2 and β_2 (for θ_2), respectively. Appellants

cite Appellants' specification, Paragraph 53 for the following description of FIGS. 6A which depicts FIG. 6B. The three-dimensional XYZ axes are superimposed on the front cross-sectional view of the distribution plate **40** depicted in FIG. 6B. In FIG. 6A, the XY plane is a front cross-sectional view of the distribution plate **40**, and the right triangle ABO is in the XY plane. The line AB of the right triangle ABC is also in the XY plane. However, the line or path **175** of the channels of the second type **5** from the distribution plate **40** may be offset by an angle DAC **215** equal to α_2 **with respect to** the plane XY as it exits the surface **43**. In like manner, the line or path **175** of the channels of the second type **5** from the distribution plate **40** may be offset by an angle BAC **220** equal to β_2 **with respect to** the plane XY as it exits the surface **43**. The offset angles α_2 and β_2 **with respect to** the XY plane may be from about 0 to -45 and about 0 - +45 degrees **with respect to** the XY plane of the cross-sectional view.

Referring to FIG. 5 and Paragraph 54 of Appellants' specification, and by analogy to the offset of the line or path **175** by the offset angles α_2 and β_2, the line or path **162** from the channels **3** of the first type may be offset **from the XY plane** of the cross-sectional view of the distribution plate **40** by α_1 and β_1. The offset angles α_1 and β_1 may be from about 0 to -45 degrees and about 0 - +45 degrees **with respect to** the XY plane of the cross-sectional view of the distribution plate **40**.

Therefore, the offset angles α_1 and β_1 and α_2 and β_2 of claims 3 and 19 is **with respect to** the XY plane and thus must extend into a Z dimension, which is a third dimension along the Z axis of the XYZ coordinates.

The Examiner stated that Deacon *et al.* teaches "various hole patterns one of which includes a flow at an angle of 45 to less than 90 degrees (i.e. 72°) **with respect to** the XY plane,

and the flow path is offset **from the XY plane** at an offset angle ∀ and ∃ (sic) (as defined in the Applicants' specification in paragraph 53) at a range of angles 0 to ± 45° (See FIG. 19)". See Office Action, page 3, paragraph 2.

Appellants' respectfully submit that the angle of 45 to less than 90 degrees (i.e. 72°) **with respect to** the XY plane of the distribution plate of Deacon *et al.* could not be the offset angles α_1 and β_1, and α_2 and β_2, of claims 3 and 19 because FIG. 19 of Deacon *et al.* only teaches two dimensions. FIG. 19 of Deacon *et al.* only teaches the bottom surface of the distribution plate which is perpendicular to the XY plane of Deacon's distribution plate. Nowhere does Deacon *et al.* teach or suggest offset angles with respect to the XY plane.

Deacon *et al.* describes that FIG. 19 "shows a hole pattern with alternating directions of holes adjacent one another." Deacon *et al.*, column 8, lines 54 - 56. Nowhere in FIG. 19 or its description does Deacon teach or suggest any plane other than the surface of the distribution plate. Further, the only directions Deacon discloses are "alternating directions of holes adjacent one another" in the surface of the distribution plate. Id. Deacon does not disclose the orientation of FIG. 19 **with respect to** the wafer or substrate. Appellants respectfully contend that Deacon *et al.* is incapable of teaching or suggesting the offset angles of claims 3 and 19, because Deacon *et al.* only teaches or suggest one plane or two dimensions in all its Figures and disclosure.

Appellants respectfully submit that contend that the Examiner has not presented an argument directed to the preceding requirements of claims 3 and 19. The Examiner maintains that Deacon *et al.* teaches Appellants offset angles α_1 and β_1 and α_2 and β_2 of Claims 3 and 19. Yet FIG. 19 of Deacon *et al.* only teaches two dimensions.

GROUND OF REJECTION 2

Claim 4 stands rejected as allegedly unpatentable under 35 U.S.C. 103(a) over Mitani *et al.* ("JP '780") and Deacon *et al.*, US Patent 5,792,269 ("U.S. '269") as applied to Claims 1, 3, 5-7, 9-12, 17, and 19-20 above, and further in view of Plavidal *et al.*, US Patent 5,718,795 ("U.S. '795").

Since claim 4 depends from claim 1, which Applicants have argued *supra* to not be unpatentable over Mitani in view of Deacon under 35 U.S.C. §103(a), Applicants maintain that claim 4 is likewise not unpatentable over Mitani in view of Deacon and further in view of Plavidal under 35 U.S.C. §103(a).

In addition with respect to claim 4, Appellants respectfully contend that Mitani in view of Deacon does not disclose the feature: "wherein the distribution plate comprises a material selected from the group consisting of polytetrafluoroethylene, fluorinated ethylene propylene, acetyl homopolymer resin, polyimide, polyetherimide, polyarylate, polycarbonate, and combinations thereof".

The Examiner admits that Mitani and Deacon do not disclose the preceding feature of claim 4, but cites Plavidal as allegedly disclosing polytetrafluoroethylene in a dispersion plate.

The Examiner alleges the following motivation for modifying Mitani and Deacon to incorporate the preceding feature of claim 4: "The motivation for making the dispersion plate out of polytetrafluoroethylene is to provide a material of construction, which is required but not disclosed by Mitani et al and Deacon et al. Polytetrafluoroethylene is well known in the art and is used because it is chemically inert."

Thus, Appellants contend that the Examiner has not satisfied the Examiner's burden to prove a *prima facie* case of obviousness in relation to claims 3 and 19. Accordingly, Appellants contend that the rejection of claims 3 and 19 is improper.

In light of the foregoing discussion, Appellants respectfully submit that claims 3 and 19 are in condition for allowance under 35 U.S.C. 103(a).

In response, Appellants assert that the Examiner has not established that the prior art teaches or suggests the preceding alleged motivation. Established case law requires that the prior art must contain some suggestion or incentive that would have motivated a person of ordinary skill in the art to modify a reference or to combine references. See Karsten Mfg. Corp. V. Cleveland Gulf Co., 242 F.3d 1376, 58 U.S.P.Q.2d 1286, 1293 (Fed. Cir. 2001 ("In holding an invention obvious in view of a combination of references, there must be some suggestion, motivation, or teaching **in the prior art** that would have led a person of ordinary skill in the art to select the references and combine them in a way that would produce the claimed invention"). See also In re Gordon, 733 F.2d 900, 902, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984 ("The mere fact that the prior art could be so modified would not have made the motivation obvious **unless the prior art suggested the desirability of the modification**.").

Therefore, the Examiner has not established a *prima facie* case of obviousness in relation to claim 4.

GROUND OF REJECTION 3

Claim 8 stands rejected as allegedly unpatentable under 35 U.S.C. 103(a) over Mitani *et al.* ("JP '780") and Deacon *et al.*, US Patent 5,792,269 ("U.S. '269") as applied to Claims 1, 3, 5-7, 9-12, 17, and 19-20 above, and further in view of Hasegawa *et al.*, US Patent 5,837,093 ("U.S. '093").

Since claim 8 depends from claim 1, which Applicants have argued *supra* to not be unpatentable over Mitani in view of Deacon under 35 U.S.C. §103(a), Applicants maintain that claim 8 is likewise not unpatentable over Mitani in view of Deacon and further in view of Hasegawa under 35 U.S.C. §103(a).

In addition with respect to claim 8, Appellants respectfully contend that Mitani in view of Deacon does not disclose the feature: "wherein the chamber further comprises a lower annular ring that includes a plurality of holes extending over an exhaust port".

The Examiner admits that Mitani and Deacon do not disclose the preceding feature of claim 8, but cites Hasegawa as allegedly disclosing the preceding feature of claim 8.

The Examiner argues: "Hasegawa et al teaches an annular ring 29 that includes a plurality of holes 30 extending over an exhaust port 31."

The Examiner alleges the following motivation for modifying Mitani and Deacon to incorporate the preceding feature of claim 8: "The motivation for adding the annular ring with a plurality of holes of Hasegawa et al in the apparatus of Mitani et al and Deacon et al is to improve the uniformity of the flow across the wafer and to the exhaust port, thereby improving the uniformity of the processed wafer.

In response, Appellants assert that the Examiner's argument for modifying Mitani and Deacon by the alleged teaching of Hasegawa is not persuasive. Appellants assert that Hasegawa, column 3, lines 17-18 recites: "the lower electrode 23 is surrounded by a baffle plate 29, which has a plurality of through holes 30. An exhaust pipe 31 is connected to one side of the reaction chamber 11". Hasegawa, col. 4 lines 56-57 teaches high speed etching using "an etching inhibiting gas." Nowhere does Hasegawa teach a motivation for the plurality of through holes, except for exhausting the etching inhibiting gas.

In further response, Appellants assert that the Examiner's argument for modifying Mitani and Deacon by the alleged teaching of Hasegawa is additionally not persuasive. The Examiner's alleged motivation of "improving the uniformity of the processed wafer" does not apply to Mitani, because Mitani already achieves a uniformity of coverage to within ±3 % as discussed *supra*.

Therefore, the Examiner has not established a *prima facie* case of obviousness in relation to claim 8.

SUMMARY

In summary, Appellant respectfully requests reversal of the April 5, 2006 Office Action rejection of claims 1, 3-12, 17, 19 and 20.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Newton *et al.* Examiner: Lund, Jeffrie Robert

Serial No.: 10/065,879 Group Art Unit: 1763

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Title: **NON-PLASMA REACTION APPARATUS AND METHOD**

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APPENDIX A - CLAIMS ON APPEAL

1. An apparatus comprising:

a chamber adapted for holding a workpiece having a surface layer adapted for being etched; and

a distribution plate including a first plurality of channels for providing a first fluid to flow into the chamber at an angle θ_1 with respect to an exposed surface of the distribution plate and a second plurality of channels for providing a second fluid to flow into the chamber at an angle θ_2 with respect to the exposed surface of the distribution plate, wherein the first plurality of channels and the second plurality of channels are arranged in rings around a common point of the distribution plate, and wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees.

3. The apparatus of claim 1, wherein paths of the first plurality of channels and paths of the second plurality of channels originate in an XY plane of the distribution plate and wherein each

angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees with respect to the XY plane and wherein each angle θ_1 is offset from the XY plane at an offset angle α_1 and β_1 with respect to the XY plane, and wherein each angle θ_2 is offset from the XY plane at an offset angle α_2 and β_2 with respect to the XY plane, and wherein α_1, β_1, α_2, and β_2 are selected from the group consisting of from about 0 to -45 and from about 0 to +45 degrees with respect to the XY plane.

4. The apparatus of claim 1, wherein the distribution plate comprises a material selected from the group consisting of polytetrafluoroethylene, fluorinated ethylene propylene, acetyl homopolymer resin, polyimide, polyetherimide, polyarylate, polycarbonate, and combinations thereof.

5. The apparatus of claim 1, wherein the rings of the first and second types are concentric rings, wherein each ring has a diameter from about 1.75 inches to about 7.04 inches.

6. The apparatus of claim 1, wherein paths of the fluids through the distribution plate further comprises grooves and wherein a volume of the grooves is greater than a volume of the channels.

7. The apparatus of claim 1, wherein the rings around the center point of the distribution plate have shapes selected from the group consisting of circles, ellipses, rectangles, squares and combinations thereof.

8. The apparatus of claim 1, wherein the chamber further comprises a lower annular ring that includes a plurality of holes extending over an exhaust port.

9. The apparatus of claim 1, wherein the chamber further comprises an upper annular ring, wherein a space is created between an edge of the upper annular ring and a wall of the chamber, and wherein the space restricts a flow of fluids in the chamber.

10. The apparatus of claim 9, wherein the opening between the upper annular ring and either the workpiece or the chamber wall is at least 3/8 inch.

11. The apparatus of claim 1, wherein the distribution plate is located from about 1/8 inch to about 3 ½ inches from a surface of the workpiece.

12. The apparatus of claim 1, the first fluid comprises ammonia gas and the second fluid comprises hydrogen fluoride gas, the first fluid and the second fluid are adapted to react inside the chamber to form a self-limiting etchable layer on a portion of the adapted surface layer of the workpiece.

17. A distribution plate comprising:

a first plurality of channels for providing a first fluid to flow into a chamber at an angle θ_1 with respect to an exposed surface of the distribution plate; and

a second plurality of channels for providing a second fluid to flow into the chamber at an angle θ_2 with respect to the exposed surface of the distribution plate, wherein the first plurality of channels and the second plurality of channels are arranged in rings around a common point of the distribution plate, and wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees.

19. The distribution plate of claim 17, wherein paths of the first plurality of channels and the second plurality of channels originate in an XY plane of the distribution plate and wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees with respect to the XY plane and wherein each angle θ_1 is offset from the XY plane at an offset angle α_1 and β_1 with respect to the XY plane, and wherein each angle θ_2 is offset from the XY plane at an offset angle α_2 and β_2 with respect to the XY plane, and wherein α_1, β_1, α_2, and β_2 are selected from the group consisting of from about 0 to -45 and from about 0 to +45 degrees with respect to the XY plane.

20. The distribution plate of claim 17, wherein the first fluid is provided to the first plurality of channels and the second fluid is provided to the second plurality of channels without premixing of the first and second fluids.

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Title: **NON-PLASMA REACTION APPARATUS AND METHOD**

Commissioner for Patents
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Alexandria, VA 22313-1450

APPENDIX B - EVIDENCE

There is no evidence entered by the Examiner and relied upon by Appellant in this appeal.

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APPENDIX C - RELATED PROCEEDINGS

There are no proceedings identified in the "Related Appeals and Interferences" section.